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THE BRYOLOGIST

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No. 3

ILLUSTRATED KEY TO THE WESTERN SPHAGNACEAE¹

T. C. FRYE

SPHAGNUM, Peat Moss

Plants grayish when dry. Branches usually tufted. Leaves veinless. Leaf-cells of 2 quite different kinds, the large hyaline ones with spiral or ring-like thickenings in their walls, the narrow long green ones alternating with the hyaline ones and so narrow that they might be mistaken for the walls of the hyaline ones. Calyptra irregularly torn. Capsule elevated by a false stalk which is a modified branch. Lid deciduous. Peristome none. Plants of undrained bogs; or on high mountains and in cool regions growing in damp places in almost any situation. (Gk. *sphagnos*, some kind of moss.)

KEY AND COMPARISON OF SPECIES

- A. Cortical cells of the stems and branches with spiral thickenings (see Pl. XVII, fig. 2). GROUP 1
- AA. Cortical cells of the stems and branches without spiral thickenings (see Pl. XIX, fig. 1).
- B. Branches in tufts of 6-12. GROUP 2
- BB. Branches in tufts of 1-6.
- C. Green cells of the branch-leaves in cross section not exposed on either surface, the cell-cavity elliptic (see Pl. XVIII, fig. 12). GROUP 2
- CC. Green cells of the branch leaves in cross section exposed exclusively or more broadly on the outer side (see Pl. XVIII, fig. 14), or if with central cell-cavity and about equal exposure on the 2 sides (see Pl. XIX, fig. 8) then the plants brownish-green rather than reddish-green.
- D. Stem-leaves not fimbriate nor lacerate, small, pointed (Pl. XIX, fig. 3). GROUP 2
- DD. Stem-leaves fimbriate or lacerate, large or small, pointed to rounded (see Pl. XX, fig. 5). GROUP 3
- CCC. Green cells of the branch-leaves in cross section exposed exclusively or more broadly on the inner side (Pl. XXII, fig. 13), or if with central cell-cavity and about equal exposure on the 2 sides (Pl. XXI, fig. 9) then the plants reddish-green rather than brownish-green. GROUP 4

¹ The arrangement and condensed nature of this paper prevents acknowledgment to various authors whose works have been found useful, except perhaps the most admirable treatment of the genus by A. L. Andrews in *Flora of North America*.

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GROUP 1

- 1a. Green cells of the branch-leaves in cross section with elliptic or oval cell-cavity, not exposed on either surface or slightly on the inner.

- 2a. Hyaline cells bulging outward about $\frac{1}{8}$ their thickness, their walls smooth where applied to the green cells; (3) stem-leaves wide at apex.

*Sphagnum magellanicum*² Brid.—Alaska to Calif.; eastern N. Amer.

- 1a. Green cells of the branch-leaves in cross section lenticular to truncately elliptic, usually about equally exposed on both surfaces.

- 2b. Hyaline cells bulging outward about $\frac{1}{4}$ their thickness, their walls smooth to densely papillose where applied to the green cells; (3) stem-leaves narrow at apex.

Sphagnum papillosum Lindb.—Alaska to Wash.; eastern N. Amer. (Pl. XVII)

- 1b. Green cells of the branch-leaves in cross section an isosceles-triangle narrower than equilateral, exposed on the inner surface only.

- 2a. Hyaline cells bulging outward about $\frac{1}{4}$ their thickness, their walls smooth where applied to the green cells; (3) stem-leaves wide at apex.

Sphagnum palustre L.³—Alaska to Calif.; eastern N. Amer. (Pl. XVII)

- 1b. Green cells of the branch-leaves in cross section an equilateral triangle, exposed on the inner surface only.

- 2b. Hyaline cells bulging outward about $\frac{1}{2}$ their thickness, their walls strongly papillose to fibrillose where applied to the green cells; (3) stem-leaves rather narrow at apex.

Sphagnum imbricatum Hornsch.⁴—Alaska; eastern N. Amer. (Pl. XVIII)

GROUP 2

- 1a. Branches in tufts of 6–12; hyaline cells of branch-leaves very finely papillose where applied to the green cells, bulging more on the outer than on the inner surface; (2) green cells of the branch-leaves in cross section with widest exposure on outer side, or equally on the 2 sides, (3) in cross section truncately elliptic; (4) hyaline cells of the branch-leaves bulging hardly at all on the inner surface, (5) with 1–8 pores on the outer surface and 1–4 on the inner.

Sphagnum wulfianum Girg.—Vancouver Island, B. C.; eastern N. Amer. (Pl. XVIII)

- 1b. Branches in tufts of 2–6; hyaline cells of the branch-leaves smooth where applied to the green cells, bulging more on the inner than on the outer surface.

² *S. medium* Limpr.; *S. intermedium* Russ.

³ *S. cymbifolium* Ehrh.; also American specimens which have been referred to *S. turfaceum* Warnst.

⁴ *S. austini* Sull.

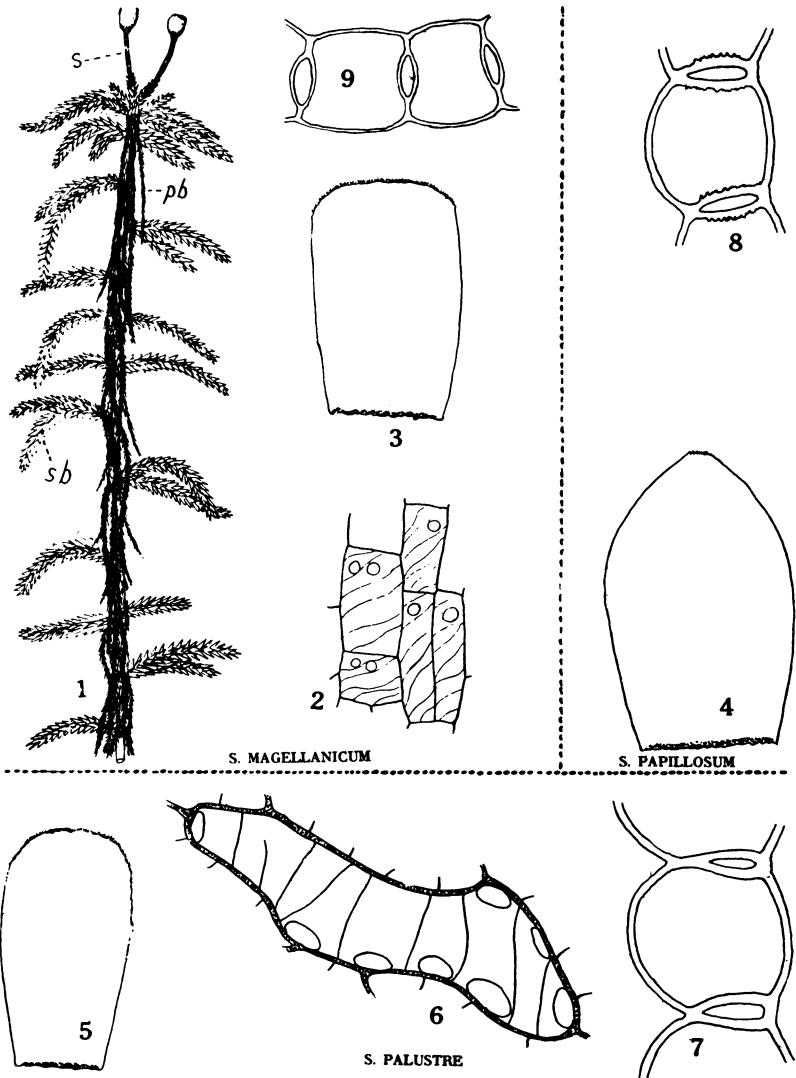


PLATE XVII

(1) Plant; *s*, stalk-like branch bearing capsule; *sb*, spreading branch; *pb*, pendent branch; $\times 1$. (2) Cortical cells of stem showing spiral thickenings and pores, $\times 125$. (3, 4, 5) Stem-leaves, $\times 22$. (6) Hyaline cell from middle region of leaf of spreading branch, showing pores on outer side, $\times 343$. (7, 8, 9) Portions of cross sections of leaves of spreading branches, $\times 400$.

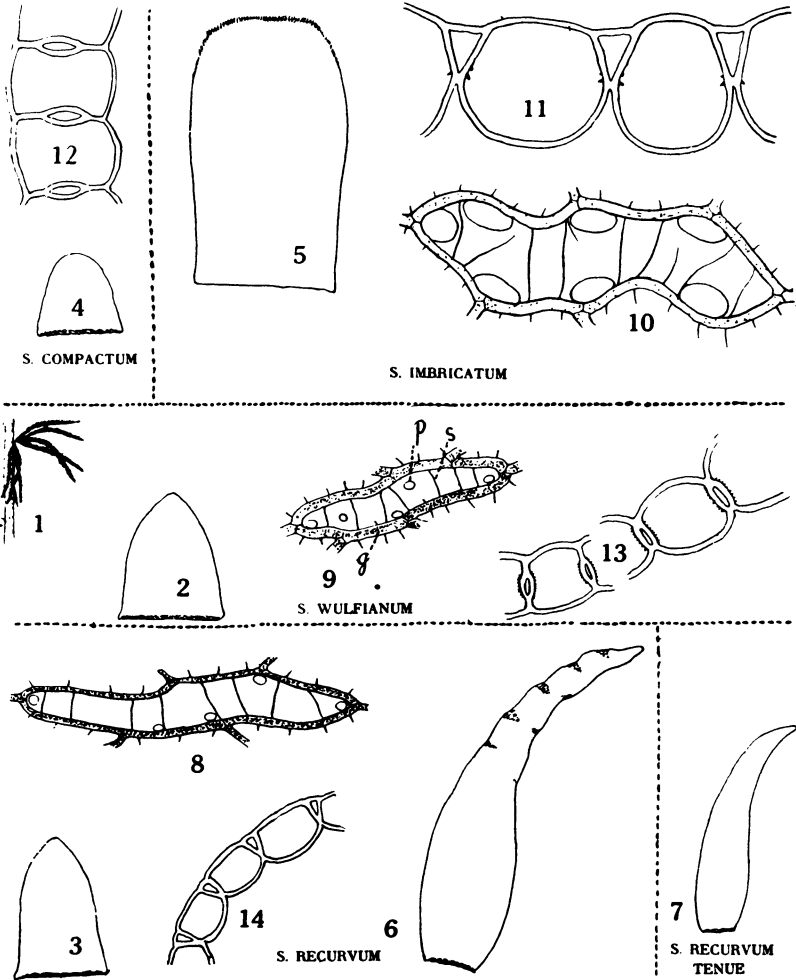


PLATE XVIII

(1) Portion of plant showing spreading and pendent branches, $\times 1$. (2, 3, 4, 5) Stem-leaves, $\times 22$. (6, 7) Leaves of spreading branches, $\times 33$. (8) Hyaline cell from middle region of leaf of spreading branch, showing pores on *inner* side, $\times 343$. (9, 10) Hyaline cells from middle regions of leaves of spreading branches, showing pores on outer side, $\times 343$. (11, 12, 13, 14) Portions of cross sections of leaves of spreading branches; g, green cell; p, pore; s, spiral thickening; $\times 400$.

- 2a. Green cells of the branch-leaves in cross section wholly included, (3) elliptic; (4) hyaline cells of the branch-leaves bulging about $\frac{1}{6}$ their thickness or less on the inner surface, (5) with 4-8 pores on the outer surface and usually 3 on the inner.

Sphagnum compactum DC.—Alaska to Wash.; eastern N. Amer.
(Pl. XVIII)

- 2b. Green cells of the branch-leaves in cross section with widest exposure on outer side, or not at all exposed on inner side.

- 3a. Green cells of the branch-leaves in cross section triangular.

- 4a. Hyaline cells of the branch-leaves bulging about $\frac{1}{4}$ their thickness or less on the inner surface, (5) with 2-6 pores on the outer surface and 4-7 on the inner.

- 6a. Branch-leaves undulate toward their tips.

Sphagnum recurvum Beauv.—Alaska to Wash. and Colo.; eastern N. Amer. (Pl. XVIII)

- 6b. Branch-leaves not undulate.

Sphagnum recurvum tenue Kling.—Alaska to Wash. and Idaho; northern N. Amer. (Pl. XVIII)

- 4b. Hyaline cells of the branch-leaves bulging about $\frac{1}{2}$ their thickness or less on the inner surface, (5) with 0-3 pores on the outer surface and 0-3 on the inner.

Sphagnum tenellum Pers.⁵ Alaska to B. C.; northeastern N. Amer. (Pl. XIX).

- 2b. Green cells of the branch-leaves in cross section with widest exposure of the outer side but also exposed on the inner side.

- 3b. Green cells of the branch-leaves in cross section trapezoidal; (4) hyaline cells of the branch-leaves bulging $\frac{1}{6}$ their thickness or less on the inner surface, (5) with 5-12 pores on the outer surface and mostly none on the inner.

Sphagnum dusenii Jens.—Alaska.⁶ (Pl. XIX).

- 2b. Green cells of the branch-leaves in cross section with widest exposure on the outer side, or equally on the 2 sides.

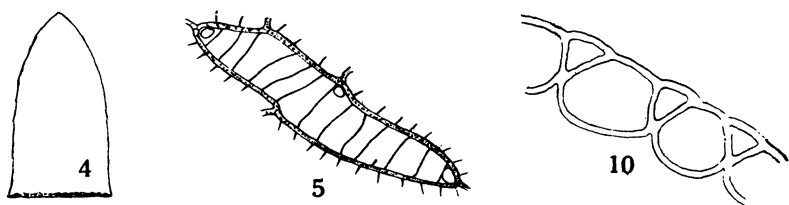
- 3c. Green cells of the branch-leaves in cross section truncately elliptic; (4) hyaline cells of the branch-leaves bulging $\frac{1}{8}$ their thickness on the inner surface, (5) with 10-20 pores on the outer surface and 1-4 on the inner.

Sphagnum subsecundum Nees⁷—Wash. to Mex.; eastern N. Amer.
(Pl. XIX)

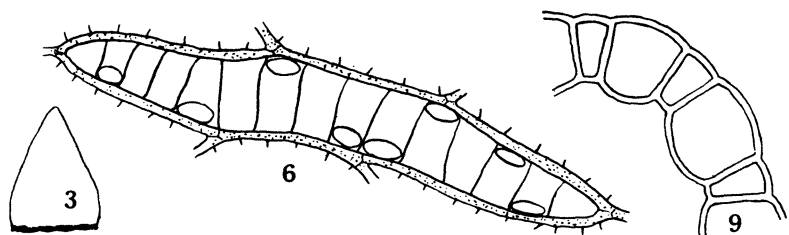
⁵ *S. molluscum* Bruch.

⁶ Univ. Calif. Pub. Bot. 2: 313. 1907.

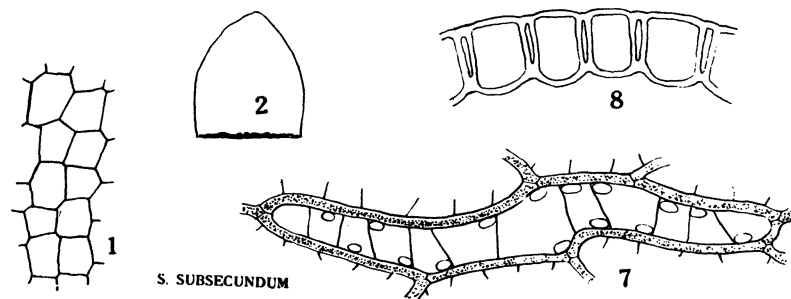
⁷ *S. contortum* Schultz; *S. platyphyllum* Sull.; *S. rufescens* Limpr.; *S. obesum* Wils.; *S. dasyphyllum* Warnst.; *S. plicatum* Warnst.; *S. Orlandense* Warnst.; *S. mobilense* Warnst.; *S. simile* Warnst.



S. TENELLUM



S. DUSENII



S. SUBSECUNDUM

PLATE XIX

(1) Cortical cells of the stem, $\times 125$. (2, 3, 4) Stem-leaves, $\times 22$. (5) Hyaline cell from middle region of leaf of spreading branch, showing pores on *inner* side, $\times 343$. (6, 7) Hyaline cells from the middle portions of the leaves of spreading branches, showing pores on *outer* side, $\times 343$. (8, 9, 10) Portions of cross sections of leaves of spreading branches, $\times 400$.

GROUP 3

- 1a. Green cells of the branch-leaves in cross section about equally exposed on the 2 surfaces, truncately elliptic; hyaline cells of the branch-leaves bulging more on the outer side; (2) stem-leaves longer than wide, mediumly large, (3) somewhat lacerate at tip; (4) hyaline cells of the branch-leaves with 6-14 medium-sized pores on the outer side and 2-8 pores on the inner.

Sphagnum angstroemii Hartm.—Alaska; Yukon (Pl. XX).

1b. Green cells of the branch-leaves in cross section exposed only on the outer side or much less on the inner side, triangular or trapezoidal; hyaline cells of the branch-leaves bulging more on the inner side.

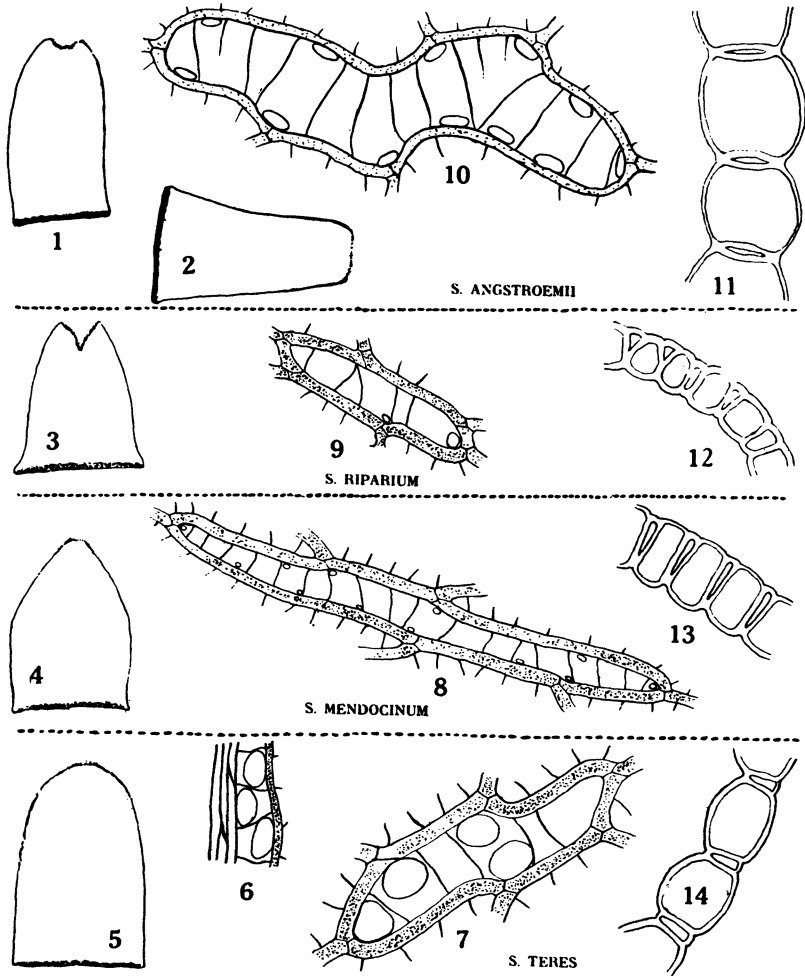


PLATE XX

(1, 2, 3, 4, 5) Stem-leaves, X 22. (6) Margin of branch-leaf, X 250. (7, 8, 9, 10) Hyaline cells from the middle regions of leaves of spreading branches, showing pores on outer side, X 343. (11, 12, 13, 14) Portions of cross sections of the leaves of spreading branches, X 400.

- 2a. Stem-leaves rather longer than wide, rather large.
3a. Stem-leaves with 1 deep rent in the middle at the tip; (4) hyaline cells of the branch-leaves with 2-5 small pores on the outer side and 0-10 large ones on the inner.
Sphagnum riparium Angstr.—Alaska to B. C.; northeastern N. Amer. (Pl. XX).
3b. Stem-leaves slightly lacerate at tip, without a rent.
4a. Hyaline cells of the branch-leaves with 15-20 small pores on the outer side and 5-15 small ones on the inner.
Sphagnum mendocinum Sull. & Lesq.—B. C. to Calif. and Idaho (Pl. XX).
3b. Stem-leaves weakly lacerate-fimbriate at tip, without a rent.
4a. Hyaline cells of the branch-leaves with 3-6 large pores on the outer side and 1-4 large ones on the inner.
5a. Branch-leaves ovate-lanceolate, usually imbricate.
Sphagnum teres (Schimp.) Angstr.⁸—Alaska to Calif. (Pl. XX).
4b. Hyaline cells of the branch-leaves with 1-10 medium-sized pores on the outer side and 0-10 medium-sized ones on the inner.
5b. Branch-leaves ovate-hastate, usually squarrose.
Sphagnum squarrosum Crome—Alaska to Calif. and Colo.; northeastern N. Amer. (Pl. XXI)
2b. Stem-leaves rather wider than long, rather small, (3) very slightly lacerate at tip; (4) hyaline cells of the branch-leaves with 7-8 small pores on the outer side and 3-4 rather small ones on the inner.
Sphagnum Balticum Russ.⁹—Alaska; Greenland.
2c. Stem-leaves wider than long, large, (3) widely lacerate at tip; (4) hyaline cells of the branch-leaves with 1-4 small pores on the outer side and 1-4 medium-sized ones on the inner.
Sphagnum lindbergii Schimp.—Alaska to B. C.; northeastern N. Amer. (Pl. XXI).

GROUP 4

- 1a. Outer walls of the surface cells of the stem porose, normally with 1 pore per cell.
2a. Stem-leaves fimbriate-lacerate both at sides and at tip; (3) hyaline cells of the branch-leaves bulging $\frac{1}{8}$ - $\frac{1}{2}$ their thickness on the outer side; (4) plant yellowish-green or brownish-green; (5) outer surface of branch-leaves with rather small elliptic pores.
Sphagnum fimbriatum Wils.¹⁰—Alaska to Calif. and Wyo.; northeastern N. Amer. (Pl. XXI).
2b. Stem-leaves fimbriate-lacerate only across the broad truncate tip; (3) hyaline cells of the branch-leaves bulging $\frac{1}{8}$ - $\frac{1}{2}$ their thickness on the

⁸ *S. squarrosum* Sull.

⁹ This is not illustrated for lack of material.

¹⁰ *S. microphyllum* Warnst.; *S. bolanderi* Warnst.

outer side; (4) plant yellowish-green or brownish-green; (5) outer surface of the branch-leaves with rather small elliptic pores.

Sphagnum girgensohnii Russ.¹¹—Alaska to Oreg.; northeastern N. Amer. (Pl. XXII).

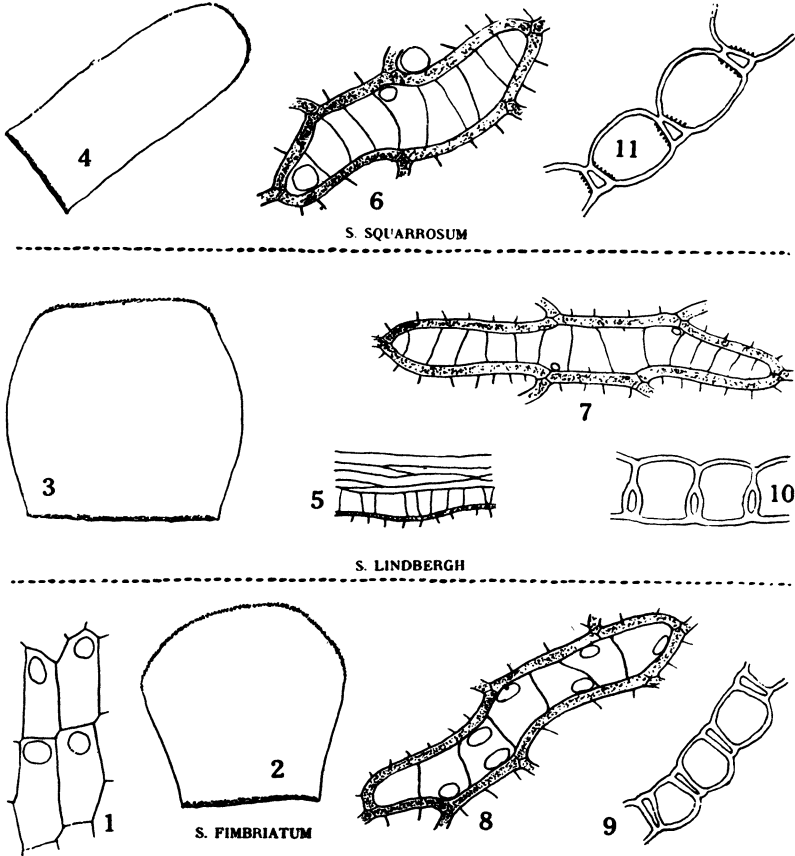


PLATE XXI

(1) Cortical cells of the stem, $\times 125$. (2, 3, 4) Stem-leaves, $\times 22$. (5) Margin of branch-leaf, $\times 250$. (6, 7, 8) Hyaline cells from the middle regions of leaves of spreading branches, showing pores on outer side, $\times 343$. (9, 10, 11) Portions of cross sections of leaves of spreading branches, $\times 400$.

¹¹ *S. mehueri* Warnst.

- 2c. Stem-leaves only slightly lacerate at the narrowed tip, or not at all lacerate; (3) hyaline cells of the branch-leaves bulging $\frac{1}{8}$ – $\frac{1}{4}$ their thickness on the outer side; (4) plants reddish-green or merely green; (5) outer surface of the branch-leaves with large elliptic pores.

Sphagnum robustum (Russ.) Roell.¹²—Alaska to Wash. and Colo.: northeastern N. Amer. (Pl. XXII).

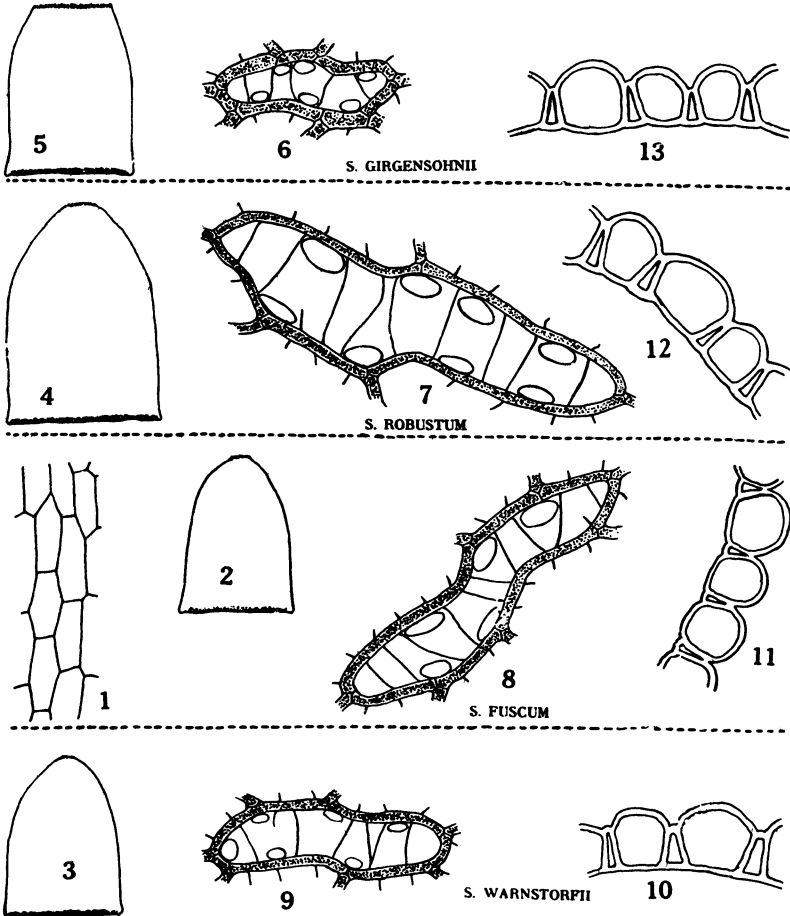


PLATE XXII

(1) Cortical cells of the stem, $\times 125$. (2, 3, 4, 5) Stem-leaves, $\times 22$. (6, 7, 8, 9) Hyaline cells from the middle regions of leaves of spreading branches, showing pores on outer side, $\times 343$. (10, 11, 12, 13) Portions of cross sections of leaves of spreading branches, $\times 400$.

¹² *S. russowii* Warnst.

1b. Outer walls of the surface cells of the stem normally without pores; (2) stem-leaves not or only slightly lacerate at tip.

3a. Hyaline cells of the branch-leaves bulging $\frac{1}{8}$ – $\frac{1}{2}$ their thickness on the outer side.

4a. Plants brownish-green rather than reddish-green; (5) outer surface of the branch-leaves with rather large elliptic pores.

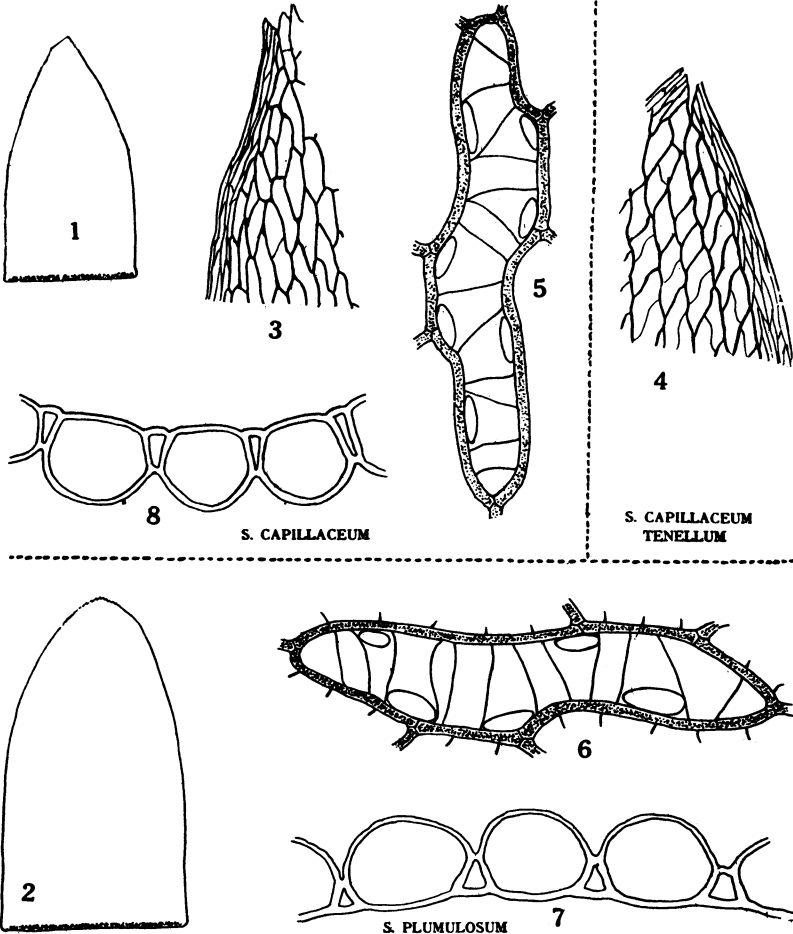


PLATE XXIII

(1, 2) Stem-leaves, $\times 22$. (3, 4) Portions of tips of stem-leaves, $\times 32$. (5, 6) Hyaline cells from middle regions of leaves of spreading branches, showing pores on outer side, $\times 343$. (7, 8) Portions of cross sections of leaves of spreading branches, $\times 400$.

Sphagnum fuscum (Schimp.) Kling.¹³—Alaska to Wash. and Colo.; northeastern N. Amer. (Pl. XXII).

- 4b. Plants reddish-green rather than brownish-green.
5a. Outer surface of the branch-leaves with small roundish strongly-ringed pores at $\frac{1}{2}$ – $\frac{2}{3}$ the distance from the leaf-base.

Sphagnum warnstorffii Russ.—Alaska to Colo.; northeastern N. Amer. (Pl. XXII).

- 5b. Outer surface of the branch-leaves with much larger and more elliptic pores.
6a. Most of the hyaline cells of the upper halves of the stem-leaves not divided by fibrils.

Sphagnum capillaceum (Weiss.) Schrank.¹⁴—Alaska to Wash. and Colo.; northeastern N. Amer. (Pl. XXIII).

- 6b. Most of the hyaline cells of the upper halves of the stem-leaves divided by fibrils.

Sphagnum capillaceum tenellum (Schimp.) Andr.¹⁵—Alaska to Wash.; northeastern N. Amer.

- 3b. Hyaline cells of the branch-leaves bulging $\frac{1}{2}$ – $\frac{2}{3}$ their thickness on the outer side; (4) plant greenish or brownish or somewhat purplish; (5) outer surface of the branch-leaves with large elliptic pores.

Sphagnum plumulosum Roell.¹⁶—Alaska to Calif.; northeastern N. Amer. (Pl. XXIII).

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JAGERINOPSIS SQUARROSA, N. SP.¹

E. G. BRITTON

Plants bright green, glossy, climbing on trees; primary stems slender, decumbent and rooting, with small appressed bract-like leaves, which are only .5–1 mm. long, lanceolate-acuminate, ecostate, and entire, or with a short faint costa; secondary stems stout, erect, red, simple and unbranched, 1–2 cm. rarely 4–5 long, rarely tapering off into slender flagellate innovations; leaves crowded, spreading, 1.5–2 mm. long x 1–1.33 mm. wide, rarely wider than long, broadly ovate or cordate, carinate or concave; apex variable, acute or acuminate, serrulate, not subulate, often recurved; margins minutely and obscurely serrulate to base, each marginal cell ending in a small tooth; costa variable, single, and broadest at base, or forking at apex, or rarely double and short, usually extending to less than $\frac{1}{2}$ the length of the leaf, rarely $\frac{3}{4}$; basal cells largest, irregular and porose; alar cells slightly different, denser and yellow or brown with thick walls, median and apical cells narrowly linear-vermicular, 27–54 μ long by 2–4 μ wide; all porose and smooth. Dioicous? only female plants seen. Archegonia in small lateral buds about 1 mm. long, with acuminate, serrulate, ecostate leaves and few paraphyses.

¹³ *S. vanconveriense* Warnst.

¹⁴ *S. acutifolium* Ehrh.

¹⁵ *S. rubellum* Wils.; *S. tenellum* Kling.

¹⁶ *S. subnitens* Russ. & Warnst.

¹ See BRYOLOGIST 21: 27. 1918.